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**Theme:**

**The Control and Elimination of Preventive  
Chemotherapy Neglected Tropical Diseases  
(PC/NTDs) in Nigeria: Strategy for meeting the  
WHO 2030 Elimination goals**

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## **Onchocerciasis in Nigeria 2: Appraisal of seven years (May 2015 – May 2022) of onchocerciasis elimination programme**

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### **Abstract**

This paper is an appraisal of seven years (May 2015 – May 2022) of onchocerciasis elimination programme in Nigeria. The evidence that the elimination of transmission of onchocerciasis is feasible with repeated ivermectin treatment encouraged the Federal Ministry of Health (FMoH) to embark on the elimination of onchocerciasis and inaugurated National Onchocerciasis Elimination Committee (NOEC) in 2015. The mandate and the strategic plan of NOEC are geared towards meeting up with the 2021-2030 road map to eliminate onchocerciasis in order to attain the Sustainable Development Goals. The tools for entomological and epidemiological evaluation, the indicators of interruption and elimination of onchocerciasis as well as the classification and reclassification of transmission zones/States are discussed. At the inauguration of NOEC in 2015, there was no State or zone in Nigeria where onchocerciasis was interrupted or eliminated. By May 2022, despite the challenges encountered in the exercise, onchocerciasis has been eliminated in two States, interruption of transmission has been achieved in 4 States and a total of 10.2 million persons from 58 Local Government Areas are no longer in need of MDA for onchocerciasis. The results of the seven-year stewardship of onchocerciasis elimination in Nigeria are encouraging. However, there is still the need to strengthen and sustain the elimination strategies towards eliminating onchocerciasis by 2030 in the country.

**Keywords:** Onchocerciasis, Nigeria, Seven Years, Elimination Programme

## Introduction

Onchocerciasis is one of the 10 Neglected Tropical Diseases (NTDs) targeted for elimination through the WHO's Roadmap on NTDs, which started in 2012-2020 [1] and now extended to 2020-2030 [2]. This was designed to intensify cross-cutting approaches, which involved integrating delivery platforms; mainstreaming with local health systems; coordinating beyond health; strengthening country capacity and mobilizing regional and global resources.

Achieving elimination of onchocerciasis requires providing access to mass drug administration (MDA) for every eligible person in at-risk communities. It requires sustained annual treatment coverage rates of  $\geq 80\%$  at the community level for a period of 15–20 years [3]. In Nigeria, multi-site studies on the feasibility of onchocerciasis elimination with ivermectin treatment (sponsored by WHO/APOC) were carried out (2009-2012) in some randomly selected endemic foci. This showed that large-scale treatment with ivermectin stopped further infections, especially in areas where there was a high percentage of treatment and population coverage. These results encouraged the Federal Ministry of Health (FMOH) to embark on the elimination of onchocerciasis with the objective to reduce, by 2020, the transmission of *Onchocerca volvulus* infection through MAM to the point where the parasite population is irreversibly moving to its demise/extinction in all defined onchocerciasis transmission zones in the country.

To achieve this objective, the FMOH inaugurated the National Onchocerciasis Elimination Committee (NOEC) on May 23, 2015, to provide technical support and advice in line with the WHO guideline for the elimination of onchocerciasis [3]. The FMOH gave the following Terms of Reference (ToR) to the NOEC:

- (a) “Provide technical advice on onchocerciasis elimination to the Federal Ministry of Health;
- (b) Support the Government of Nigeria to develop a national guideline and road map for onchocerciasis elimination in Nigeria;
- (c) Assess where and when breakpoint have been reached and recommend to the Hon. Minister of Health the localities where ivermectin treatment can be safely stopped; and
- (d) Support the government in the preparation of the country's dossier for verification of Nigeria as having interrupted the transmission of onchocerciasis infection nationwide”.

### Strategic Plan

With the inauguration of the NOEC, this Committee of experts critically studied the Terms of Reference (ToR) and decided to develop a strategic plan or pathway to enable the country to create the road map and blueprint for the elimination of onchocerciasis in line with WHO Guideline [3]. In doing this, the Committee asked the following questions:

1. Where are we now?
2. How did we get to where we are now?
3. Where do we want to be in the future?
4. How are we going to get there?
5. What additional skills or resources will be required to achieve strategic objectives?
6. How do we know when we have achieved our goal?

To be able to answer the strategic questions, NOEC set up the following goals for itself:

1. Generate the map of Nigeria showing the pre-control nodule endemic.
2. Collate all the available recent and historic onchocerciasis epidemiological and entomological data in 2015.
3. Create tables for each transmission status and indicate implementation strategies to achieve interruption/elimination of onchocerciasis.
4. Create a map of Nigeria showing transmission status colour code by States based on historical epidemiological and entomological data.
5. Produce the National Guidelines for the elimination of onchocerciasis in line with WHO Guideline [3]
6. Develop a nationwide sample site for epidemiological and entomological evaluation.
7. Conduct Onchocerciasis Elimination Mapping (OEM) of all the transmission zones and reclassify the transmission zones in view of emerging results.
8. In areas where *Loa loa* was suspected, conduct operational research to assess the prevalence of *Loa loa* infection and risk of central nervous system events, especially in

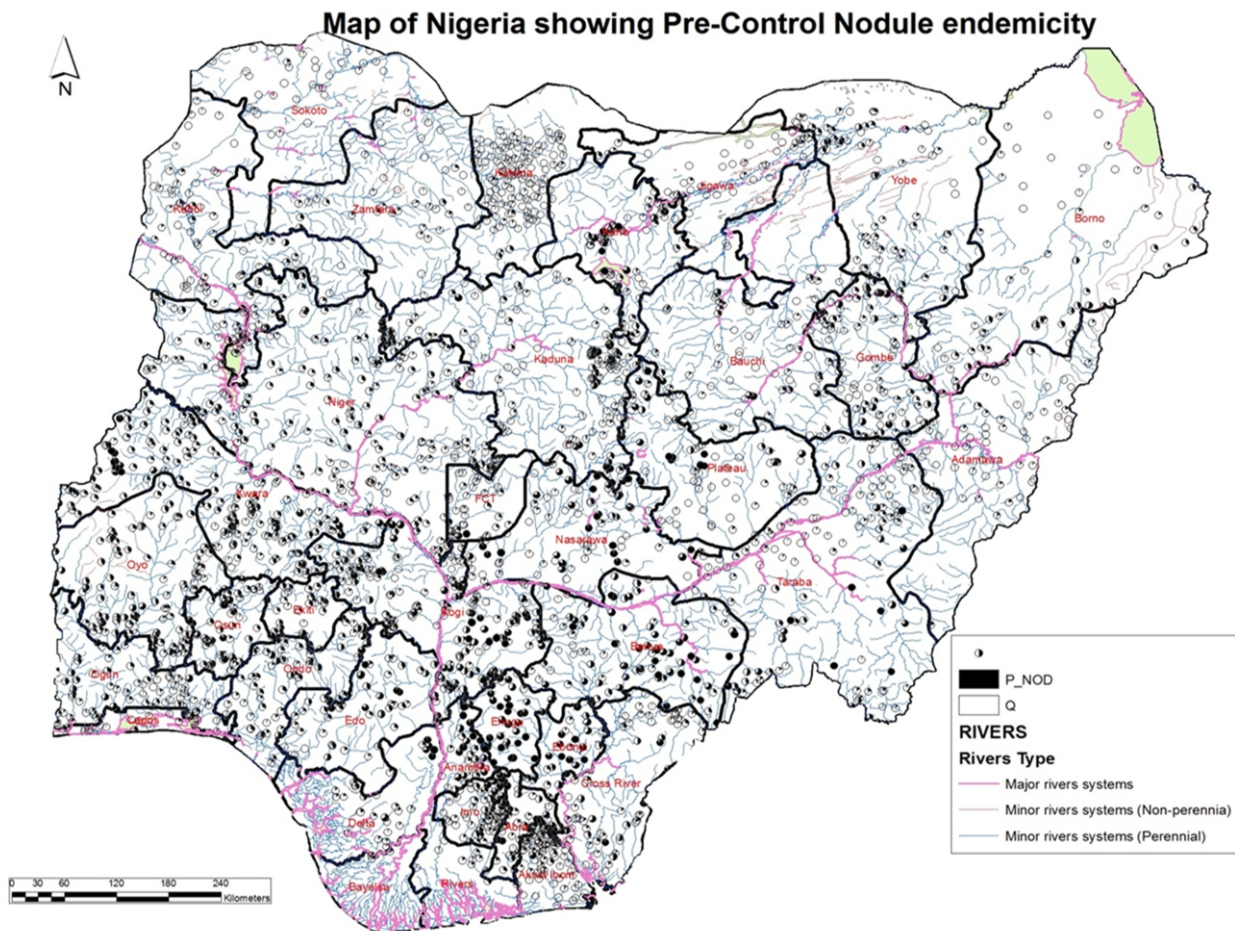


9. Continued evaluation of the impact of treatment on each transmission zone under treatment of all the transmission zones until onchocerciasis is eliminated in all the transmission zones.
10. Assess where and when breakpoints have been reached and recommend to the FMOH the localities where ivermectin treatment can be safely stopped.
11. Support the government in the preparation of

the country's dossier for verification of Nigeria as having interrupted the transmission of onchocerciasis infection nationwide.

*Appraisal of the Performance of NOEC  
Generate the map of Nigeria showing the pre-control nodule endemic.*

This has been developed from NOCP and APOC documents (WHO, 2007) (Fig. 1)



**Fig. 1a: The map of Nigeria showing the pre-control nodule endemic (WHO-APOC)[4]**

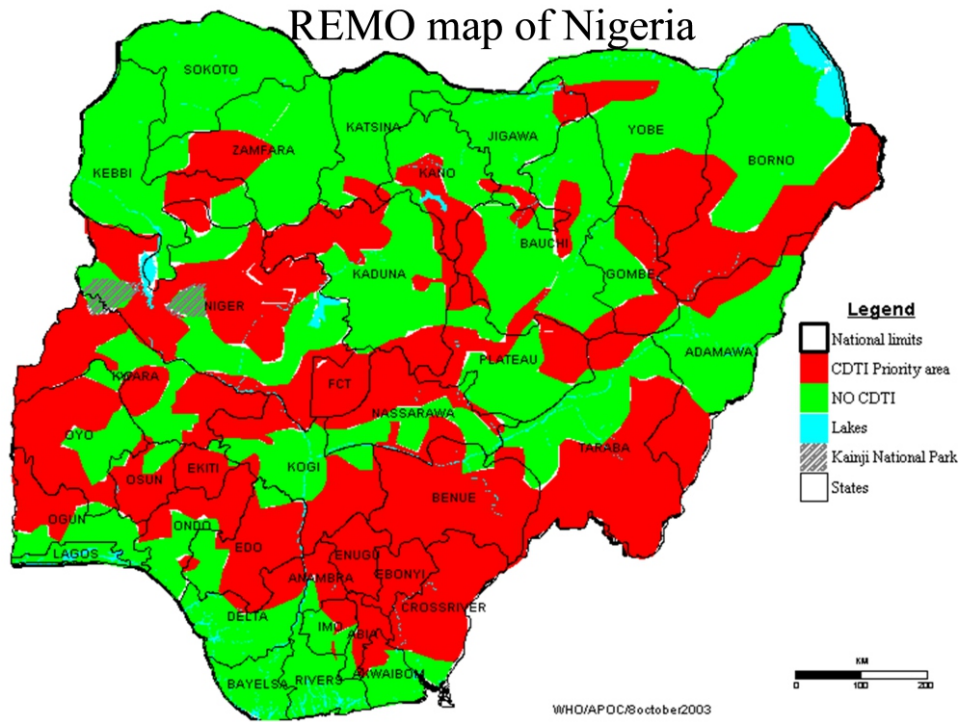


Fig. 1b: Showing the pre-intervention REMO map of Nigeria (WHO-APOC) [4]

Collate all the available recent and historic onchocerciasis epidemiological and entomological evaluation data (Fig. 2)

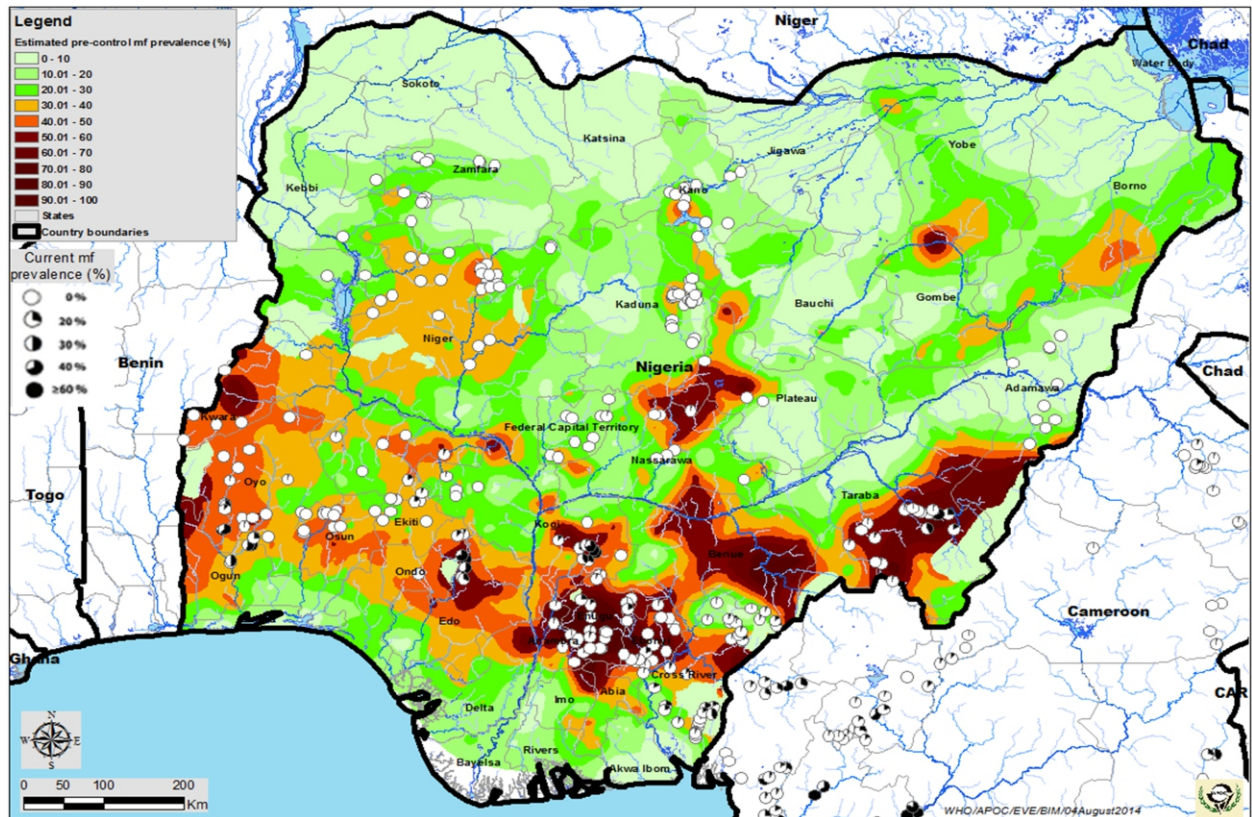


Fig. 2: Collated historic onchocerciasis epidemiological and entomological evaluation data [4,5]



Create tables for each transmission status and indicate implementation strategies to achieve interruption/elimination of onchocerciasis (Table 1)

**Table 1a: Transmission Status Group 1: Areas where there has been no evaluation since the commencement of MDA, areas previously classified hypo or non-endemic for onchocerciasis by REMO/REA, or where environmental changes have favoured the breeding of vectors and transmission of onchocerciasis.**

Colour	Tool for Evaluation	Indicator(s)	Reclassification or Programme of Action
<b>Blue</b>	OV16 RDT or ELISA in children below 10 yrs (at least 3000 children per transmission zone)	(a) >5%  (b) $\geq 1 - \leq 5\%$  (c) <1%	(a) Classify as Red and treat twice per year  (b) Classify as Yellow if the area is already under MAM otherwise classify as red and treat twice per year  (c) Classify as Tan or non-endemic
<b>States in this group were:</b> Bornu, Bauchi, Gombe, Yobe, Akwa Ibom, Jigawa, Sokoto, Lagos, Rivers, Bayelsa and Katsina			

**Table 1b: Transmission Status Group 2: Areas where transmission is still ongoing in line with ONCHOSIM Model even with MDA**

Colour	Tool for Evaluation	Indicator(s)	Reclassification or Programme of Action
<b>Red</b>	OV16 RDT or ELISA in children below 10 yrs (at least 3000 children per transmission zone)	(a) >5%  (b) $\geq 1 - \leq 5\%$  (c) <1%	(a) Classify as Red and treat twice per year  (b) Classify as Yellow if the area is already under MAM otherwise classify as red and treat twice per year  (c) Classify as Tan or non-endemic
<b>States in this group were:</b> Cross River, Abia, Imo, Enugu, Anambra, Edo, Ondo, Ogun, and Benue			

**Table 1c: Transmission Status Group 3: Area where onchocerciasis interruption is on track by 2020 in line with ONCHOSIM Model**

Colour	Tool for Evaluation	Indicator(s)	Reclassification or Programme of Action
<b>Yellow</b>	OV16 RDT or ELISA in children below 10 yrs (at least 3000 children per transmission zone)	(a) >5%  (b) $\geq 1 - \leq 5\%$  (c) <1%	(a) Classify as Red and treat twice per year  (b) Classify as Yellow if the area is already under MAM otherwise classify as red and treat twice per year  (c) Classify as Tan or non-endemic
<b>States in this group were:</b> Ekiti, Osun, Oyo, Adamawa, Delta, Taraba, FCT, Kwara, Kogi, Niger and Kano			

**Table 1d: Transmission Status Group 4: Areas where it was suspected that interruption of transmission of onchocerciasis had been achieved**

Colour	Tool for Evaluation	Indicator(s)	Reclassification or Programme of Action
<b>Tan</b>	(a) OV 16 ELISA testing of children <10 yrs. (at least 3,000/State) and  (b) PCR of flies (a total of at least 6,000 flies from at least 3 catching sites per State in the transmission zone)	<b>If the result of (a) &lt;0.1% of the children and result of (b) is &lt;1 infective fly per 2,000 flies and/or ATP &lt;20</b>  <b>If however (a) and (b) are not met:</b>	Stop Mass Administration of Mectizan (MAM) and classify the zone as Ash. Then start Post Treatment Surveillance (PTS)  Continue MAM, as per the Flow Chart for stopping MAM (Figure 4)
<b>States in this group were:</b> Plateau, Ebonyi, Nasarawa, Kaduna, Kebbi and Zamfara			

**Table 1e: Transmission Status Group 5: Areas where interruption of onchocerciasis transmission had been achieved and persons in the area need no MDA (Post Treatment Surveillance (PTS) needed)**

Colour	Tool for Evaluation	Indicator(s)	Reclassification or Programme of Action
<b>Ash</b>	After 3-5 years in PTS PCR of flies, from a total of $\geq 6,000$ flies from $\geq 3$ catching sites per State in the transmission zone	(a) <1 infective fly per 2,000 flies and/or ATP <20 and  (b) >1 infective fly per 2,000 flies and/or ATP <20	(a) Transmission eliminated, reclassify as green  (b) Conduct OV 16 ELISA testing of children <10 yrs. (at least 3,000/State) and follow the decision tree and reclassify accordingly (Fig 4)
<b>In 2015 -2016, no state was in this group</b>			

**Table 1f: Transmission Status Group 6: Areas where transmission of onchocerciasis had been eliminated (Post Elimination Surveillance (PES) commences)**

Colour	Tool for Evaluation	Indicator(s)	Reclassification or Programme of Action
<b>Green</b>	Repeat evaluation every 3-5 years:  (a) OV 16 ELISA testing of children <10 yrs. ( $\geq 2,000$ /State) OR  (b) PCR of flies (a total of $\geq 6,000$ flies from $\geq 3$ catching sites per State in the transmission zone)	<b>If the result of ) OV 16 ELISA in children is &lt;0.1% Or the result of PCR of flies is &lt;1 infective fly per 2,000 flies and/or ATP &lt;20</b>  <b>If however (a) or (b) is not met:</b>	Transmission is still eliminated (Post Elimination Surveillance continues for 3-5 years)  Identify the hot spots in the transmission zone and treat twice a year for three years and thereafter evaluate. Using OV16 or PCR
<b>In 2015-2016, no State was in this group</b>			

The implementation strategies used in Nigeria to achieve interruption of transmission and elimination of onchocerciasis are based on the WHO Guideline Algorithm Table 3 [4].

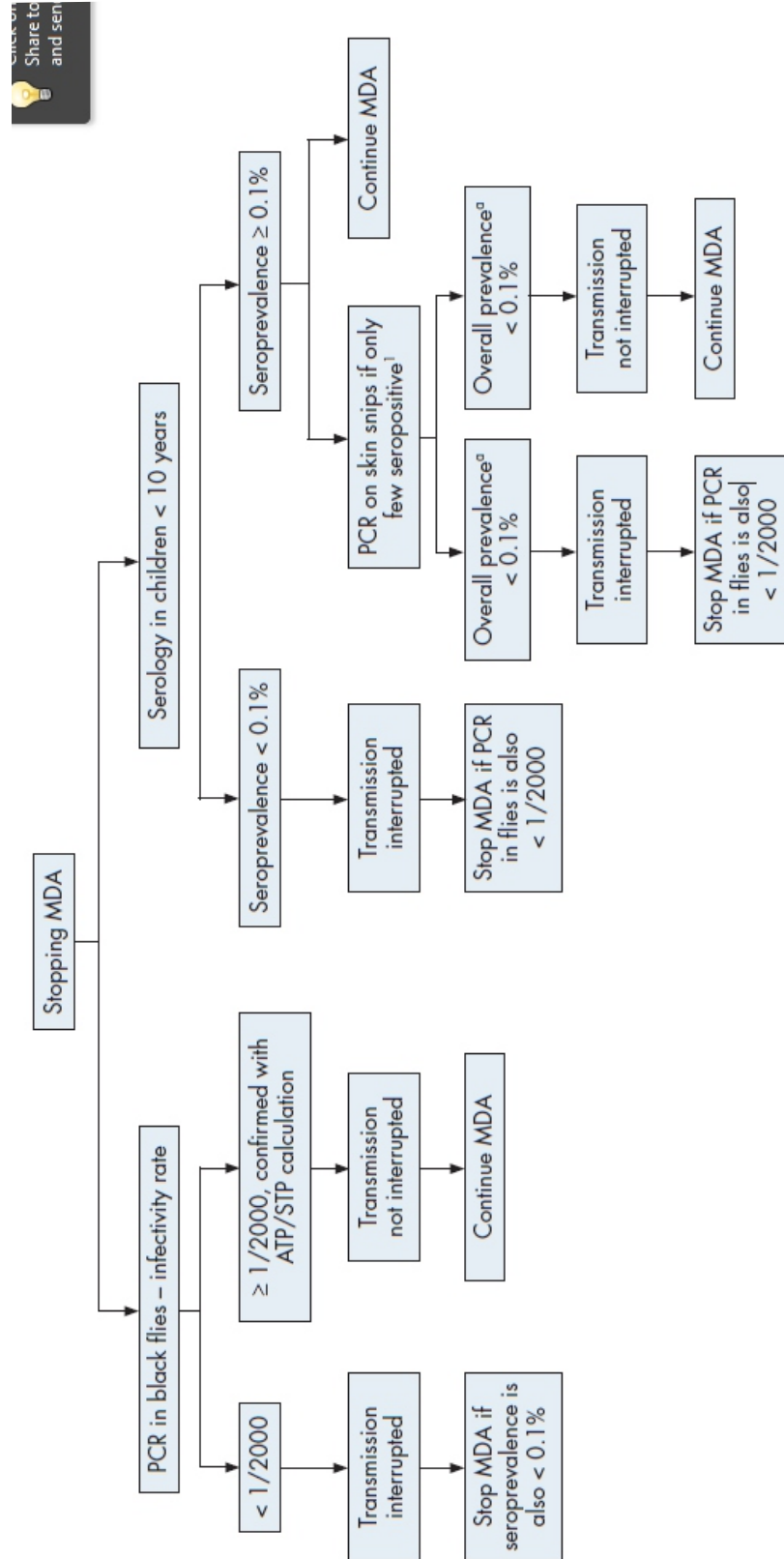
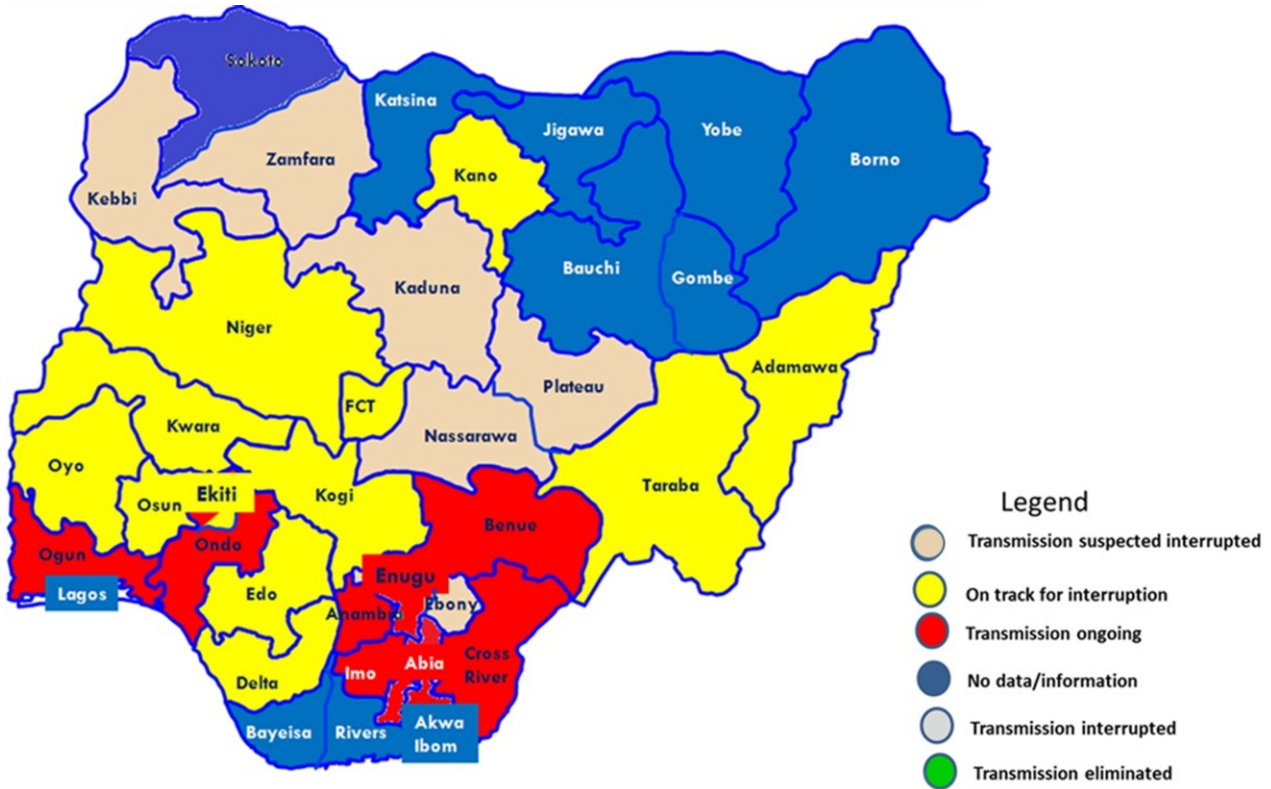


Fig. 3: Showing the Algorithm for declaring transmission interruption and stopping MAM [3]



Create a map of Nigeria showing transmission status colour code by states based on historical epidemiological and entomological data (Table 4)



**Fig. 5: Map of Nigeria showing transmission status colour code by States based on historical epidemiological and entomological data (NOEC) [5]**

*Production of National Guidelines for the Elimination of Onchocerciasis in Line with WHO Guideline*

One of the early charges of NOEC was to develop a National Guideline for the Elimination of Onchocerciasis to align with WHO recommendations [3]. The purpose of this guideline document is to provide a road map on the elimination of onchocerciasis transmission in Nigeria to FMOH, which could be used by policymakers to programme managers at all levels. NOEC has completed the 60-paged National Guidelines for the elimination of onchocerciasis, which was approved by the Minister, Federal Ministry of Health and published in 2027 (Fig. 5).

*Develop Nation-wide Sample Sites for Epidemiological and Entomological Evaluations.*

(a) NOEC set up the first sub-committee to

identify villages for epidemiological and entomological evaluation to determining whether MDA for onchocerciasis can be stopped in Kebbi, Zamfara, Kaduna, Plateau and Nasarawa States. The sub-committee met again the second time to extend the selection of villages for epidemiological and entomological evaluation to cover all the States of the federation, which was completed (Fig. 6)

Given the fact that the level of transmission by vector flies, distribution of onchocerciasis and the endemicity levels attained are largely determined by the ecology and behaviour of the *Simulium* vectors, random choice of the catching point/villages to be entomologically evaluated will be ineffective and inappropriate.

As a result, in entomological/epidemiological site/community selection, there was bias towards those black fly breeding sites with rapids and fast-flowing with due regard to adequate geographical



**Fig. 5: Cover page of the 60-paged National Guidelines for elimination of onchocerciasis (FMOH) [6]**

coverage. This approach is rooted in the fact that the vector flies have highly specific breeding site requirements and limited flight range. Therefore, the use of appropriate topographical maps helped the team involved with the selection to choose the evaluation site/village most likely to be seriously affected by onchocerciasis.

The process of entomological site selection consisted of the following stages: (a) Identification of the river systems (b) creation of the transmission zone on the river system and (c) exclusion of empty and unsuitable areas- areas which were likely to be onchocerciasis free either because they are without human population, without rivers or are totally unstable for black fly vector to breed such as deserts and delta areas. National parks and game reserves were also excluded from the selection. This was in line with Rapid Epidemiological Mapping of Onchocerciasis exercise [7, 8]

To be able to carry out this exercise, the sub-committee worked with topographical maps scale of 1:200,000, which provided hydrological, geological, climatological, vegetational and demographic information.

The exercise of choosing the sites for entomological evaluation started at the lowest stretch of the main river and then worked upstream. In each case, the likely villages/sites were chosen, if they were at least 30 km apart. The overriding consideration in selecting the village/site is their location in relation to potential breeding sites of black flies. While doing this, the sub-committee took into consideration the pre-control epidemiological results, especially hyper- and meso-endemic communities, rapids marked on the topographical maps and bridges (often built at rock sites)

For epidemiological evaluation, the team selected from each of the entomological evaluation



village/community (termed first line village), a second line village within a 15-20 km radius to the right and to the left of the already selected site for the epidemiological evaluation (both on the main river and tributaries)

In the selection of the entomological elimination evaluation sites, as much as possible, the villages/communities where the breeding sites were chosen for catching/trapping black flies was also chosen for epidemiological evaluation. This caused for synchronization of entomological and epidemiological results

(b) The sub-committee met for the third time at Karu in Nasarawa State, September 14-17, 2016. The objectives of this training were to:

1. Build capacity for the overall assessment of the interruption of onchocerciasis transmission in areas under ivermectin treatment or transmission foci.

2. Put in place technical structures and administrative procedures to facilitate the implementation of the study.
3. Build capacity for the assessment of the level of infection of *S. damnosum* spp by *O. volvulus* in appropriate catching points in line with WHO Guideline.
4. Train personnel on procedures and tools for epidemiological evaluation of onchocerciasis transmission in line with WHO Guideline.
5. Review and agree on timelines for the evaluation.
6. Review of the draft training manual for epidemiological and entomological evaluations in line with WHO Guideline

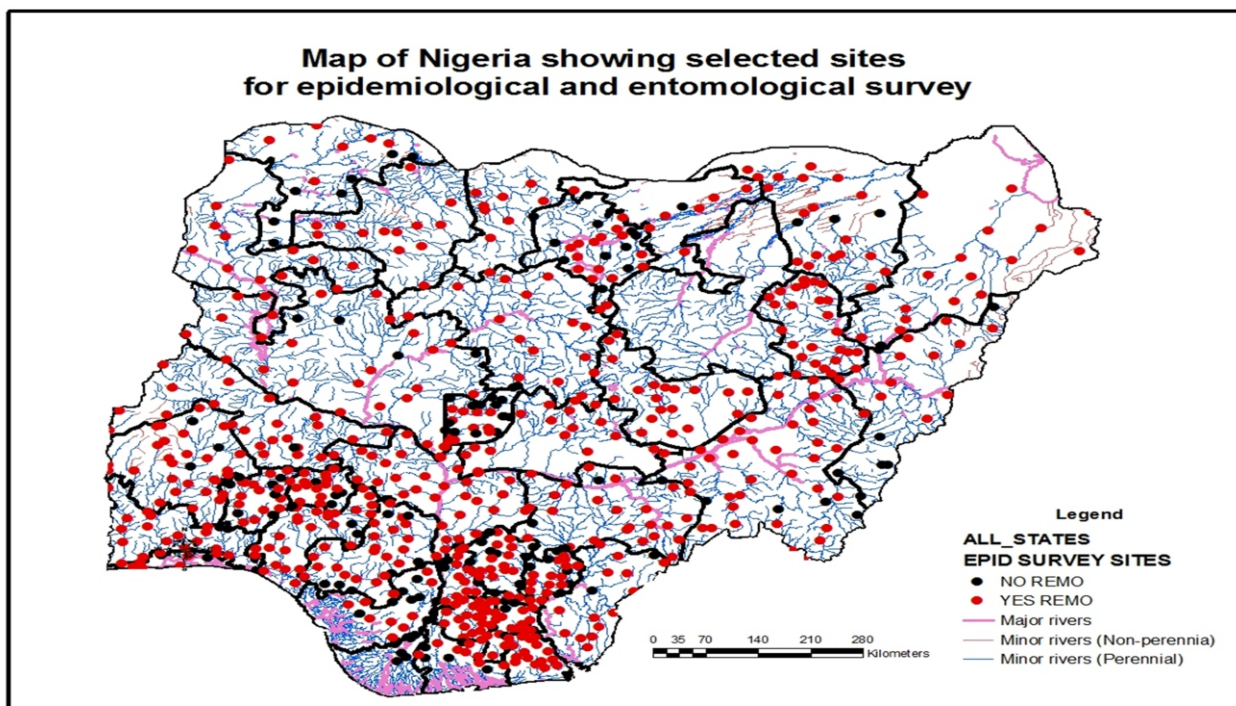
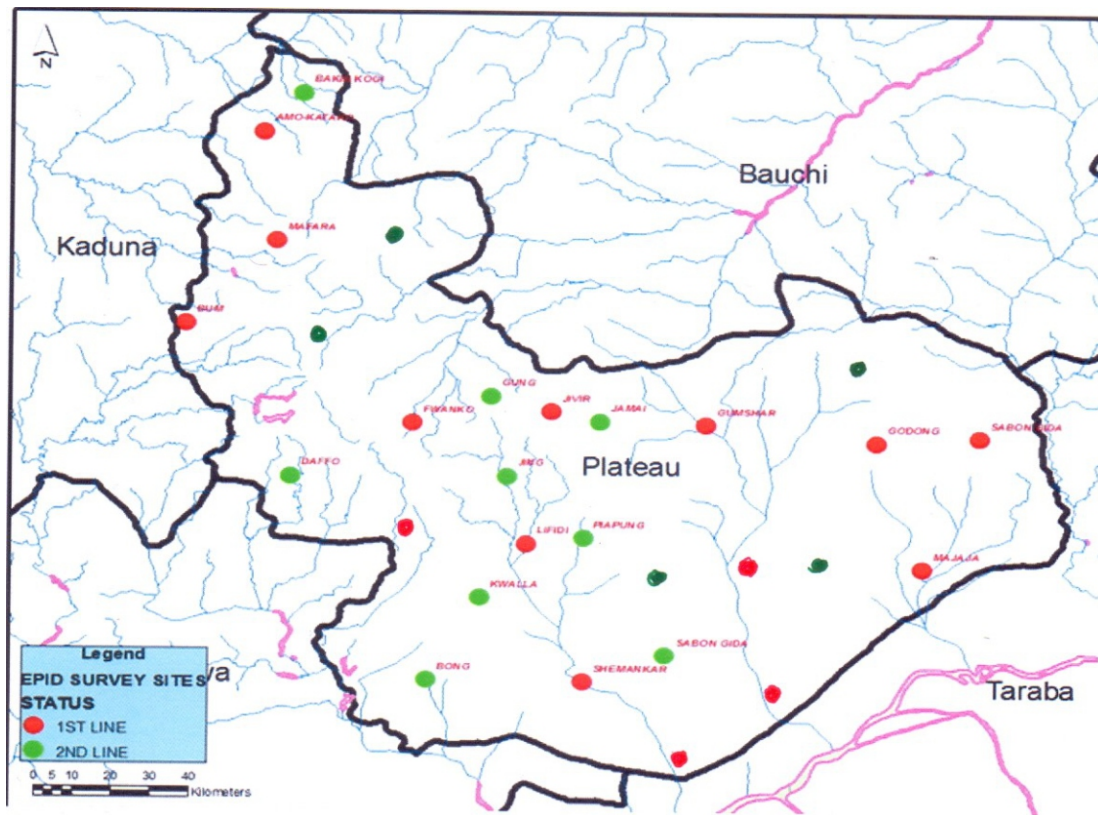


Fig. 6a: Map of Nigeria showing selected sites for epidemiological and entomological evaluation (NOEC) [9]





**Fig. 6b: Entomological/epidemiological sites selected on the river systems in Plateau State of Nigeria as an example of how these sites were chosen in all the States (NOEC) [9]**

*Conduct Onchocerciasis Elimination Mapping (OEM) of all the Transmission zones and Reclassify the Transmission zones in view of Emerging Results*  
 This has been carried out in some areas and the results will be presented in the current status of onchocerciasis in Nigeria.

*In areas where Loa loa is suspected, conduct operational research to assess the prevalence of Loa loa infection and risk of central nervous system events, especially in ivermectin naïve transmission zones.*

The Federal Ministry of Health with the support of TCC in 2016 conducted operational research on *Loa loa* infection in Nigeria using *Loa*-scope. The results were extensively discussed by NOEC, and it concluded that:

1. Nigeria has distributed over 150 million

2. treatments in the last 19 years in potentially *Loa loa* endemic areas.
  3. In the past 19 years, there had been only one (dubious) reported serious central nervous system event that was potentially attributable to ivermectin treatment in *Loa loa* areas in the country.
- The NOEC Nigeria concluded that the risk of central nervous system events in Nigeria was extremely low and recommended that ivermectin be used throughout Nigeria. However, even though WHO and the other governing bodies were happy with the result, they approve that Nigeria should thread with caution. To make assurance, Nigeria was advised that before any mass distribution of the drug is commenced in any ivermectin naïve area, there should be an evaluation of *Loa loa* prevalence and intensity.

*Continued to evaluate the impact of treatment on each transmission zone under treatment of all the transmission zones until onchocerciasis is eliminated in all the transmission zones.*

This has been carried out in most of the transmission zones/States and the results will be presented in the current status of onchocerciasis in Nigeria.

*Assess where and when breakpoints have been reached and recommend to FMoH the localities where ivermectin treatment can be safely stopped*

This has been carried out in so many States and the results will be presented in the current status of onchocerciasis in Nigeria.

*Support the government in the preparation of the country's dossier for verification of Nigeria as having interrupted the transmission of onchocerciasis infection nationwide.*

At the time of this appraisal, MAM is still ongoing for onchocerciasis and or onchocerciasis and lymphatic filariasis.

*Current Status of Onchocerciasis in Nigeria*

After seven (7) years (May 2015-May 2022) of the onchocerciasis elimination programme in Nigeria, transmission zones have been re-classified in view of emerging epidemiological and entomological results.

The entomological and epidemiological evaluation

in the programme is public health surveillance, which is an ongoing, systematic collection of female blackflies and Dried Blood Spots (DBS) from Children (aged 5-9 years), their analysis and interpretation to guide decision-making and actions on the status of onchocerciasis elimination in any transmission zone.

During the entomological and epidemiological evaluation exercises, the programme used accredited diagnostic molecular laboratories, which provided the programme with highly reliable results. The laboratories used currently are at the Carter Center, Jos; Ahmed Bello University, Zaria; Nigerian Institute of Medical Research, Lagos and Osun State University, Oshogbo.

By May 2022, these laboratories had handled more than 51,000 Dried Blood Spots (DBS) of children using serological (OV16) analysis. Also, the laboratories have processed the heads of more than 31,000 female *Simulium damnosum*, using PCR for infective larvae of *Onchocerca volvulus*. Without the robust facilities of these laboratories, it would have been impossible for the programme to register the humble successes that have been made even though we still have a backlog of samples. The results of these analyses are presented in Table 2.

**Table 2a: States/zones where Transmission has been eliminated**

S/N	State	Status in May 2015	Status in May 2022	Present action	Remark
1.	Plateau	Interruption suspected	Transmission eliminated	Post elimination surveillance	Since 2017, about 2 million persons from 12 LGAs are no longer in need of MDA
2.	Nasarawa	Interruption suspected	Transmission eliminated	Post elimination surveillance	

**Table 2b: States/zones where transmission has been interrupted**

S/N	State	Status in May 2015	Status in May 2022	Current action	Remark
1.	Kaduna	Interruption suspected	Transmission interrupted	Post-treatment surveillance (PTS)	4 million persons are no longer in need of MDA for onchocerciasis
2.	Kebbi	Interruption suspected	Transmission interrupted	Post-treatment surveillance (PTS)	2.2 million persons are no longer in need of MDA for onchocerciasis
3.	Zamfara	Interruption suspected	Transmission interrupted	Post-treatment (PTS) surveillance	
4.	Delta	On track to elimination	Transmission interrupted	Post-treatment (PTS) surveillance	2 million persons are no longer in need of MDA for onchocerciasis

NOEC approved provisional transmission interrupted for Zamfara and Kebbi States because these states are still endemic for lymphatic filariasis, thus MAM needs to continue in these States until LF is interrupted.

**Table 2c: Interruption of transmission suspected**

S/N	State	Status in May 2015	Status in May 2022	Current action	Remark
1.	Bauchi	Limited data	Interruption suspected	Collecting blackfly samples	Awaiting PCR analysis
2.	Yobe	Limited data	Interruption suspected	Collecting blackfly samples	Awaiting PCR analysis
3.	Oyo	On track to interruption	Interruption suspected	Collecting blackfly samples	Awaiting PCR analysis
4.	Ekiti	On track to interruption	Interruption suspected	Collecting blackfly samples	Awaiting PCR analysis
5.	Enugu	Limited data	Interruption suspected	Collecting blackfly samples	Awaiting PCR analysis
6.	Ebonyi	On track to interruption	Interruption suspected	Collecting blackfly samples	Awaiting PCR analysis
7.	Anambra	Limited data	Interruption suspected	Collecting blackfly samples	Awaiting PCR analysis
8.	Imo	Limited data	Interruption suspected	Collecting blackfly samples	Awaiting PCR analysis
9.	Abia	Limited data	Interruption suspected	Collecting blackfly samples	Awaiting PCR analysis
10	Cross River	Limited data	Interruption suspected	Collecting blackfly samples	Awaiting PCR analysis
11	Benue	Limited data	Interruption suspected	Collecting blackfly samples	Awaiting PCR analysis
12.	Jigawa	Limited data	Interruption suspected	Collecting blackfly samples	Awaiting PCR analysis
13/	FCT	Limited data	Interruption suspected	Collecting blackfly samples	Awaiting PCR analysis



**Table 2d: States/zones where interruption of transmission is on track.**

S/N	State	Status in May 2015	Status in May 2022	Current action	Remark
1.	Adamawa	On track to interruption	On track to interruption	DBS samples yet to be analysed	Awaiting DBS sample analysis
2.	Taraba	On track to interruption	On track to interruption	Collecting DBS samples	Awaiting DBS sample analysis
3.	Kano	On track to interruption	On track to interruption	Collecting DBS samples	Awaiting DBS sample analysis
4.	Niger	On track to interruption	On track to interruption	Collecting DBS samples	Awaiting DBS sample analysis
5.	Kwara	On track to interruption	On track to interruption	Collecting DBS samples	Awaiting DBS sample analysis
6.	Kogi	On track to interruption	On track to interruption	Collecting DBS samples	Awaiting DBS sample analysis
7.	Edo	On track to interruption	On track to interruption	Collecting DBS samples	Awaiting DBS sample analysis
8.	Ondo	Transmission ongoing	On track to interruption	Collecting DBS samples	Awaiting DBS sample analysis
9.	Osun	On track to interruption	On track to interruption	DBS samples yet to be analysed	Awaiting DBS sample analysis

**Table 2e: States/zones where transmission is ongoing**

S/N	State	Status in May 2015	Status in May 2022	Current action
1.	Ogun	Transmission ongoing	Transmission ongoing	Collecting DBS samples

**Table 2f: States/zones where there is limited epidemiological information**

S/N	State	Status in May 2015	Status in May 2022	Current action
1.	Lagos	Limited data	Limited data	Collecting DBS samples
2.	Bayelsa	Limited data	Limited data	Collecting DBS samples
3.	Rivers	Limited data	Limited data	Collecting DBS samples
4.	Akwa Ibom	Limited data	Limited data	DBS samples yet to be analyzed
5.	Bornu	Limited data	Limited data	Collecting DBS samples
6.	Gombe	Limited data	Limited data	DBS samples yet to be analyzed
7.	Katsina	Limited data	Limited data	Collecting DBS samples
8.	Sokoto	Limited data	Limited data	Collecting DBS samples

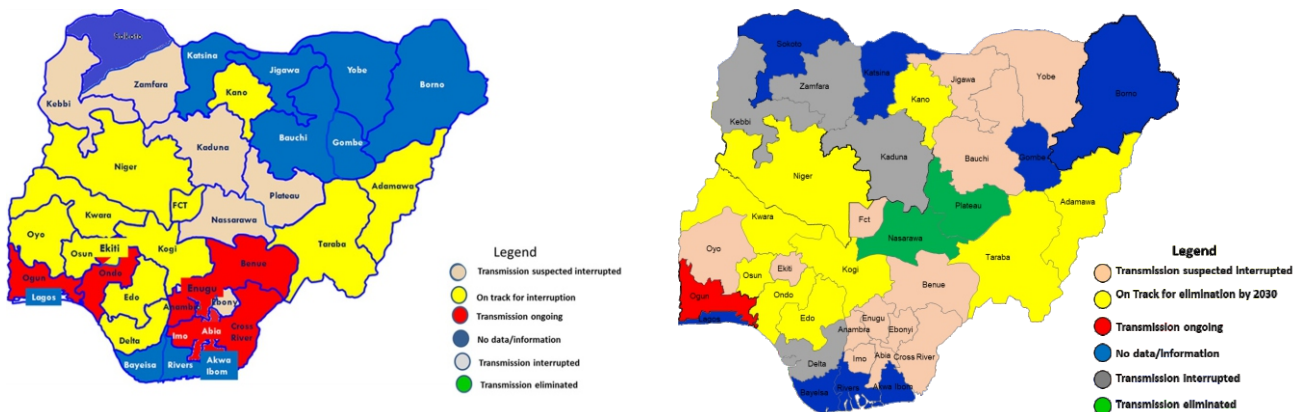


Fig. 6: Status of onchocerciasis in Nigeria in May 2015 (left) and May 2022 (right). NOEC [5,10]

Table 5: Summary of States where breakpoint have been reached and where ivermectin treatment have safely been stopped (where people no longer need MDA onchocerciasis) in Nigeria, May 2015 – May 2022

S/N	Name of state where elimination has been achieved	Number of Local Government Areas where onchocerciasis has been interrupted	Number of persons who are no longer in need of MDA for onchocerciasis
1.	Plateau State	5	2.0 million
2.	Nasarawa State	7	
3.	Kaduna State	16	2.2 million
4.	Zamfara State	6	4 million
5.	Kebbi State	9	
6.	Delta State	15	2 million
<b>TOTAL</b>		58	10.2 million

*Current Challenges*

In the course of the activities to eliminate onchocerciasis in Nigeria, some challenges were encountered, and efforts were made to address them. The major challenges are:

- Limited laboratories for OV 16 for DBS and PCR analysis of head of female black flies.
- Poor geographical and or treatment coverage.
- Difficult-to-reach endemic communities.
- Conflict or insecurity issues.
- Cross-board issues in the interruption of transmission of onchocerciasis.
- Inadequate counterpart funding of CDTI

activities.

- Demand for incentives by CDDs.
- Declining compliance due to remission of signs and symptoms of Onchocerciasis.

**Conclusion**

Seven years (May 2015 –May 2022) of activities in the elimination of onchocerciasis in Nigeria shows that onchocerciasis has been eliminated in two States and transmission has been interrupted in 4 States. A total of 10.2 million persons from 58 Local Government Areas are no longer in need of MDA for onchocerciasis in the country.

The NTD 2030 Road Map targets for onchocerciasis

are (a) to stop mass drug administration (MDA) of ivermectin in at least one focus in 34 countries and (b) to stop MDA in more than 50% of the population in at least 16 countries to stop MDA in the entire endemic population of at least 12 countries. Nigeria aims to be one of the 12 countries to stop MDA in the entire endemic population. The results of the seven stewardship of onchocerciasis elimination in Nigeria are encouraging and on track. To be able to achieve the target, there is a need to strengthen and sustain the current efforts. This is our seven years stewardship.

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#### **NGDO Partners in the elimination of onchocerciasis in Nigeria and the States where they partner are shown below:**

<b>States</b>	<b>Partners</b>
Abia	The Carter Center
Adamawa	HKI/Sightsavers
Akwa Ibom	HKI
Anambra	The Carter Center
Bauchi	MITOSATH/UNICEF
Bayelsa	CBM
Benue	Sightsavers/UNICEF
Borno	HKI
Cross River	RTI/UNICEF
Delta	The Carter Center
Ebonyi	The Carter Center
Edo	The Carter Center
Ekiti	MITOSATH/UNICEF
Enugu	The Carter Center
FCT	HANDS/CBM
Gombe	Amen Health Foundation/UNICEF
Imo	The Carter Center
Jigawa	HANDS/CBM/Sightsavers
Kaduna	Sightsavers
Kano	HANDS/CBM
Katsina	HKI/Sightsavers
Kebbi	Sightsavers
Kogi	Sightsavers
Kwara	Sightsavers
Lagos	Evidence Action/MITOSATH
Nasarawa	The Carter Center
Niger	MITOSATH/UNICEF/Sightsavers
Ogun	UNICEF/CBM
Ondo	MITOSATH/UNICEF
Osun	Amen Health Foundation/UNICEF
Oyo	UNICEF/CBM
Plateau	The Carter Center
Rivers	CBM
Sokoto	Sightsavers
Taraba	MITOSATH
Yobe	HANDS/CBM/Sightsavers
Zamfara	Sightsavers



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#### *Authors' Contributions*

NBEB conceptualized the manuscript and wrote the initial draft. ANM, CC, EUF, IAE, MMA, MHB, ME, ME, OKN and RF reviewed the draft and made contributions. All the authors approved the final draft of the manuscript.

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